

EXECUTIVE SUMMARY

NOAA's National Marine Fisheries Service (NMFS) has a mandated responsibility to sustain marine fisheries and associated habitats. The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) defines NMFS' unique role in pursuing habitat science and in developing habitat assessments to meet this mandate. Through this Plan, NMFS establishes the framework to coordinate its diverse habitat research, monitoring, and assessments and to guide the development of budget alternatives and increased support for habitat science.

The HAIP has been developed by a team of scientists from NMFS Headquarters Offices and Science Centers. This Plan represents input from a variety of NMFS staff engaged in habitat science, stock assessments, and resource management at the six Science Centers and Regional Offices, the Office of Science and Technology, the Office of Habitat Conservation, and science program managers at each Science Center. The scope of the HAIP is restricted to the 519 managed stocks and stock complexes within Fishery Management Plans, with particular focus on the 230 stocks in the Fish Stock Sustainability Index (FSSI). The conclusions and recommendations of the HAIP, however, can be applied more broadly to other managed and protected species.

The goals of the HAIP are to:

- Assist the National Oceanic and Atmospheric Administration (NOAA) in developing the habitat science necessary to meet the mandates of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA) and the economic, social, and environmental needs of the nation;
- Improve our ability to identify essential fish habitat (EFH) and habitat areas of particular concern (HAPC);
- Provide information needed to assess impacts to EFH;
- Reduce habitat-related uncertainty in stock assessments;
- Facilitate a greater number of "Marine Fisheries Stock Assessment Improvement Plan" (SAIP)¹ Tier 3 stock assessments, including those that explicitly incorporate ecosystem considerations and spatial analyses;
- Contribute to assessments of ecosystem services (i.e. the things people need and care about that are provided by marine systems); and
- Contribute to ecosystem-based fishery management (EBFM), integrated ecosystem assessments (IEA's), and coastal and marine spatial planning (CMSP).

Habitat, or the place where species live, can be characterized and described by the physical, chemical, biological, and geological components of the ocean environment. Habitat science is the study of relationships among species and their environment. Habitat science has received relatively little programmatic support compared to that received for other major disciplines (e.g. stock assessment science), and yet habitat information is needed in almost every NOAA program. Habitat science is not synonymous with ecosystem science, but habitats form the structural matrix of ecosystems, and an understanding of geospatial associations of species and their habitats can be one of the first steps in producing IEA's. A habitat assessment is the process and the products associated with consolidating, analyzing, and reporting the best available information on habitat characteristics relative to the population dynamics of fishery species and other living marine resources. Indicators of the value and condition (or status) of habitat can be developed through a habitat assessment by understanding the relationships between habitat characteristics, the productivity of fishery species, and the type and magnitude of various impacts.

There is an incontrovertible need for NMFS to move forward in implementing the HAIP. The role of marine habitats in supporting fishery production and in providing other critical ecosystem services is poorly understood. There are increasing

¹NMFS. 2001. Marine fisheries stock assessment improvement plan: Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-56, 69 p.

demands and impacts on marine habitats across many sectors of the U.S. economy. Climate change, for example, can have potentially large and far-reaching impacts on marine habitats. Lack of knowledge about the association of marine species and their habitats impedes effective fisheries and habitat management, protection, and restoration, and yet this information forms the basis for assessing impacts of human activities on ecosystem services in the context of CMSP. NMFS currently lacks a comprehensive habitat science program that is sufficiently funded to address these issues.

A number of uses for habitat assessments are highlighted in Section 3. EFH provisions in the MSRA form the cornerstone of NMFS' mandated habitat responsibilities, yet designation of EFH for many Federally managed stocks has been based on inadequate information and has been too broadly defined to provide for meaningful management measures. NMFS mandates also require adequate assessments for Federally managed stocks. Accurate assessments of the distribution and abundance of many of these stocks would benefit from improved information on their habitats. This report discusses these and other factors that define NMFS' habitat-related mandates as well as many independent reviews that recommend improved habitat science to support more effective marine resource management.

Recommendation:

- NMFS and NOAA should develop new budget and staffing initiatives to fund habitat science that is directly linked to NMFS mandates.

Habitat assessments can and should be used for habitat management, conservation, and restoration. Understanding the distribution, abundance, and functions of marine habitats also will assist in CMSP, particularly with effective siting, design, and monitoring of marine protected areas (MPA's). Further, understanding and predicting the effects of climate change and other anthropogenic impacts on ocean resources will require an increased emphasis on habitat science.

Habitat science also can inform stock assessments. Most stock assessments currently lack integration of habitat data, aside from depth and geographic stratification of fisheries-independent surveys. Uncertainty in species abundance may be reduced by considering how habitats affect:

- The design of fisheries-independent surveys and resultant estimates of stock size;
- Catchability coefficients;
- Vital rates, such as natural mortality, growth, and reproduction;
- Stock-recruit functions;
- Nursery functions; and
- The spatial and temporal scales of animal movements.

Recommendations:

- NMFS should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments.
- NMFS habitat and stock assessment scientists should work together to initiate demonstration projects that incorporate habitat data into stock assessment models, perhaps focusing on well-studied species.

Most NMFS stock assessment biologists surveyed by the HAIP Team thought that habitat-specific stock assessments would require at least some modification of existing models, if not entirely new models. This conclusion varied based on the type of habitat data, the life history of the species studied, and the geographic region in which the scientist worked.

Habitat assessments require both collection and synthesis of multiple data types at a variety of temporal and spatial resolutions. In Section 4 we describe how research efforts to collect habitat data have been fragmented and limited, with our greatest success demonstrated by the physical characterization of habitats. A survey of NMFS scientists indicated that most habitat data presently are inadequate and occur at low spatial and temporal resolutions.

From the HAIP questionnaires, NMFS scientists, resource managers, and Science Center program managers identified the following as major obstacles to producing and using credible habitat assessments:

- Lack of habitat-specific abundances;
- Insufficient staff to collect, process, analyze, and model habitat data;
- Insufficient research on environmental effects;
- Insufficient research on multispecies effects; and
- Lack of habitat-specific biological information.

Resource managers also identified an inadequate number of staff to communicate habitat information to NMFS constituents as a major obstacle to producing and using habitat assessments.

Primary challenges to the effective management of habitat data are:

- The multiplicity of data types and the large volume of habitat imagery data;
- The lack of appropriate metadata and accessibility to research data; and
- The means to efficiently collect and process data and produce the required products.

In Section 5, the HAIP Team defines three Tiers of Excellence for Habitat Assessments, which can be summarized as:

Tier 1 – Assess habitat associations for all life stages of FSSI stocks using existing data.

Tier 2 – Upgrade habitat assessments to a minimally acceptable level for all FSSI stocks and life stages, which will require new or expanded data collection and research initiatives. This effort includes the production of habitat maps; determination of habitat-specific biomass or abundance; consideration of temporal and spatial variability in habitat use; and development of habitat theory and proxies to apply to data-poor stocks.

Tier 3 – Determine habitat-specific vital rates by life stage for all FSSI stocks to quantify relationships between habitats and fishery production. This effort explicitly incorporates habitat and ecosystem considerations into stock assessments; develops habitat sensitivity and recovery indices to improve risk assessments and plans for protection and restoration; and develops baselines for IEA's.

The tiers require increasing levels of resolution in assessment data and an increased understanding of the functioning of habitats for fishery species. Progress through the tiers is not necessarily sequential and will depend on the research needs, staff expertise, and infrastructure available at each Science Center.

Inadequate numbers of technical and scientific staff have been identified as a major obstacle to credible habitat assessments. Section 5 includes the national summary of staffing requirements, as identified by program man-

Recommendations:

- NMFS should identify and prioritize data inadequacies for stocks and their respective habitats, as relevant to information gaps identified in the HAIP.
- NMFS should increase collection of habitat data on fishery-independent surveys and develop a plan for better utilizing new technologies (e.g. multibeam sonars) aboard the expanding NOAA fleet of Fishery Survey Vessels (FSV's).

Recommendations:

- NMFS habitat scientists should engage partners within and outside of NOAA to exchange information about programs and capabilities. Habitat data collection and management efforts should be coordinated, and data integration applications should be upgraded to improve accessibility and synthesis.
- NMFS should convene regional and national workshops to develop strategies to integrate habitat science and assessments, stock assessments, and IEA's.
- NMFS should establish a habitat assessment fellowship program and provide funds to graduate students and post-doctoral associates of specific subdisciplines that would advance habitat modeling, evaluation, and assessment efforts.

agers at the Science Centers, that are needed to meet the three Tiers of Excellence for Habitat Assessments (see Appendix 7 for region-by-region requirements). About 5% of total NMFS staff are currently working on habitat-related activities at the Science Centers, and an average of 33% of those staff are contractors and students supported with transient, non NMFS funds. This is a major concern given the ever-increasing demands on NMFS to effectively conserve, protect, and manage living marine resources. Full implementation of the HAIP will require a 250% increase in staff over the current habitat-related staff, and a substantial increase in funds for program operations, tools, technology, and infrastructure.

To demonstrate effectiveness of investments, NMFS must monitor program accomplishments through performance measures. In Section 6, the HAIP outlines characteristics of potential performance measures that will reflect progress toward meeting the three Tiers of Excellence for Habitat Assessments. Topic areas for evaluating performance include biological and geospatial information, habitat condition indices, and habitat assessments.

The HAIP is unique because it is the first nationally coordinated plan to focus on the marine fisheries aspects of habitat science. However, in order to make substantial progress toward collecting, managing, and synthesizing the data needed to improve our habitat assessments, it is essential that NMFS continue to foster partnerships and cooperative research programs with other groups. Section 7 and Appendix 6 of the HAIP highlight a number of important NMFS partners, including other NOAA line offices, non NOAA Federal agencies, state agencies, private foundations, universities, environmental groups, fishing organizations, and others with an interest in collecting and using similar types of habitat data, albeit often for different purposes. Partners can contribute research and development, field sites and equipment, raw data and synthesized products, scientific and technical expertise and training, and data management and archiving. All partners will benefit from, as well as contribute to, the success of the HAIP.

Recommendation:

- NMFS should unite with other NOAA line offices to develop a NOAA-wide strategic plan for habitat science and assessments in support of the nation's ocean policy priorities for EBFM, CMSP, and the use of IEA's.